

Spectroscopy of neutron-rich nuclei using a fragment detector (CHICO) plus Gammasphere*

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The technique of studying neutron-rich nuclei produced by spontaneous fission with large γ -ray arrays can be extended by using a thin source, which allows the detection of fission fragments in kinematic coincidence with the γ -rays. This method yields more information on the γ -rays than similar experiments with thick sources, and also provides additional sensitivity in the analysis of γ -ray spectra. A high statistics experiment was performed recently at Gammasphere using a thin ^{252}Cf source and the Rochester array of PPACs (CHICO). The time of flight measurement provides a means of measuring the masses of the fission fragments to within 8 amu and, along with the detection of the fission axis direction, allows a Doppler correction to be performed on an event-by-event basis. The Doppler correction enables unambiguous assignment of the γ -ray to the heavy/light fission partner. Since the fragments recoil freely, the Doppler-broadened line shape problems of sealed sources are eliminated, allowing observation of levels with lifetimes comparable to, and shorter than, the stopping time. For example, many rotational bands have been extended to spin ~ 20 , corresponding to an excitation energy of ~ 7 Mev. The geometry of the particle detector also provides a method for studying isomeric nuclei and measuring lifetimes of transitions with $\tau_{1/2} \geq 10$ ns.

Footnotes and References

* For details see this paper in Proceedings of the International Conference on Fission and Properties of Neutron-Rich Nuclei, held Nov. 10-15, 1997 on Sanibel Island, FL (in print).